PATENT ABSTRACTS OF JAPAN

(11)Publication number : 09-148973

(43)Date of publication of application : 06.06.1997

(51)Int.Cl. H04B 7/08

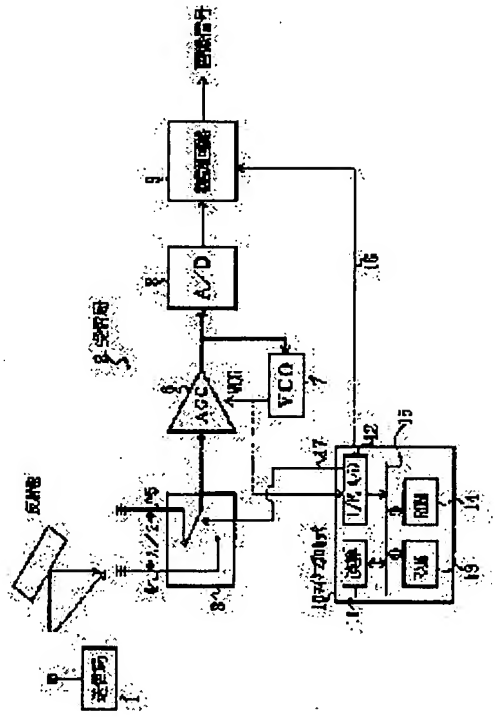
(21)Application number : 07-302471 (71)Applicant : FUJITSU GENERAL LTD

(22)Date of filing : 21.11.1995 (72)Inventor : SHINOZAKI GORO

(54) DIVERSITY RECEIVER

(57)Abstract:

PROBLEM TO BE SOLVED: To realize a high quality operation by comparing the integral values or the average value of electric field intensity detection signals of respective antennas and selecting the antenna high in value.



SOLUTION: The antennas 4 and 5 at the interval of a half-wave are provided for receiving a picture transmission signal. The intensity of respective antennas is detected for plural times for detecting which of the electric field intensity R1 and R2, which correspond to the antennas, is stronger. The integral value or the integral values are taken and compared. Then, the antenna whose intensity is stronger is selected. Namely, the control voltage value R0 of VCO 7 output is A/D converted in an I/F part 12, and it is added to intensity R1 or R2. The operation is executed for plural times on the respective antennas and values obtained by adding a value R0 to the integral value of intensity R1 or R2 are compared and judged. An antenna is selection signal 17 is supplied to wave antenna switch part 3 based on judgement. Then,

a received radio wave from the selected antenna is demodulated and the transmission/reception of higher quality is executed. Thus, the whole processing can be executed in a multi-processor 10 without especially adding any circuit.

LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to diversity reception equipment, and relates to the space diversity reception equipment which chooses the input signal to which it should restore out of the input signal from two or more antennas especially.
[0002]
[Description of the Prior Art] Diversity reception is one of the reception approaches of the electromagnetic wave accompanied by phasing, has the same modulating signal or information, and means the receiving approach of obtaining the input signal to which it should restore by choosing out of two or more sorts of input signals from which a signal-to-noise ratio differs in the flash of arbitration. There are frequency diversity reception, polarization diversity reception, space diversity reception, etc. as this diversity reception.
[0003] Outdoors, the received wave in mobile communications turns into a multiple wave in order to receive an echo, diffraction, dispersion, etc. with head lining, a floor, a wall, and the object used as other obstructions by geography, the building, and indoor. In this case, the electric wave of a large number which come around a mobile station from various directions interferes each other, and it becomes electric-field distribution of random standing wave nature. Although this is called multi-pass phasing, when a receiving station runs the inside of the electric-field distribution the standing wave stands the wavelength period lambda of a transmitted electric wave at a rate v by this multi-pass phasing, and it sees from a receiving station side, phasing will be received with the period of v/lambda.
[0004] Drawing 3 is drawing showing this phenomenon. And since the field strength of these phasing received waves falls frequently to near the thermal-noise level of a receiver, it became the failure of implementation of transmission of high quality, and has caused remarkable degradation of a bit error rate.
[0005] As a technique which mitigates the effect of this phasing, the diversity reception using two or more received waves occurs, and space diversity reception occurs as an easiest and effective approach of them. Although the phasing received wave independently changed, respectively by estranging only 1/2 wave (lambda/2) of two or more antennas of a transmitted electric wave spatially is obtained and the field strength of

the received electric wave from one antenna falls, an antenna with larger field strength is chosen and it is made to receive by the field strength from the antenna of another side being maintained enough according to this approach. Consequently, the probability for the transmission quality to deteriorate can be made to mitigate.
[0006]
[Problem(s) to be Solved by the Invention] However, conventionally, the field strength of the momentary received electric wave of arbitration was detected intricately, he is trying for the circuit for choosing the optimal antenna to choose the antenna which has received the largest field strength, and it was not necessarily able to call it the high selection approach of precision.
[0007] Then, the object of this invention is to offer the approach of being the high selection approach of precision and choosing the optimal antenna by easy circuitry more.
[0008]
[Means for Solving the Problem] Two or more antennas with which according to this invention it estranged mutually and the above-mentioned object was prepared, An on-the-strength detecting-signal generation means to input into these two or more antennas the input signal received from one of antennas among these two or more antennas as the switchable antenna switch section, and to generate the detecting signal on the strength corresponding to the field strength of this received electric wave, Input said detecting signal on the strength, and this detecting signal on the strength corresponding to the input signal which said each of two or more antennas receive is detected multiple times every. The integral value or the average of this detecting signal on the strength for every antenna is compared, and it is attained by offering the diversity reception equipment characterized by having an antenna selection means to choose the antenna corresponding to the highest value.
[0009] Here, the aforementioned detecting signal on the strength is a control voltage signal of an AGC circuit into which an input signal is inputted from an antenna, and is a RSSI signal. Moreover, an antenna selection means is for example, a microprocessor circuit.
[0010]
[Embodiment of the Invention] According to a drawing, the gestalt of operation of this invention is explained below. The following explanation is the gestalten of operation and it cannot be overemphasized that it is not what limits the technical range of this invention.

[0011] Drawing 1 is the general drawing of the gestalt of operation of this invention, and drawing 2 is the operation flow chart drawing. In drawing 1 , 1 is a sending-station side and 2 is a receiving station side. 3 is the antenna switch section, in order to receive the picture transmission signal of a space diversity method, it has 1/2 wave of two antennas 4 and 5 which carried out distance alienation, and the antenna of the one where the field strength of the electric wave to receive is strong is chosen. This selection is performed by the antenna selection signal 17 from a microprocessor 10. The input signal received from the antenna is inputted into the AGC (AutomaticGain Control) circuit 6. and the control voltage which detects DC level of the output of AGC circuit 6 which is a receiving input

level in the control voltage generation section 7, and enlarges gain when an input level is low in order to make regularity DC level of the carrier signal of an input signal inputted -- time [or] input gain is high -- gain -- control voltage VCO was generated so that the control voltage made small might be taken out, and it has fed back to AGC circuit 6. Thus, after the input signal made into fixed level is changed into a digital signal in the A/D-conversion circuit 8, it restores to it in a demodulator circuit 9.

[0012] On the other hand, since the control voltage VCO of an AGC circuit changes according to a receiving input level, the microprocessor circuit 10 judges whether the carrier signal is received by inputting this control voltage VCO and comparing it with the set-up threshold level. And according to the judgment result, it awaits and a signal 16 is supplied to a demodulator circuit 9.

[0013] And a still more important point detects this control voltage VCO suitably, and judges whether the field strength of the received electric wave of which antenna is large, and he is trying to supply the antenna selection signal 17 to the antenna switch section 3 in the microprocessor circuit 10 according to a judgment result.

[0014] In addition, the reason for using the control voltage of AGC circuit 6 for antenna selection is because control voltage VCO is changed according to the input level (field strength) of an electric wave which received as it is shown in drawing 4 . Therefore, if the signal which the microprocessor circuit 10 detects and compares is a signal which changes according to the field strength of an input signal, anything, it is good, for example, a RSSI (ReceiveSignal Strength Indicator) signal can also be used for it. Generally the RSSI signal is known as a signal which changed the operating current required to amplify to predetermined signal level with limiter amplifier into the electrical potential difference.

[0015] In the microprocessor circuit 10, ROM14 RAM13, the program, the various parameters, etc. as the interface section 12 and operation part 11 which have the A/D-conversion section, and storage memory are remembered to be is connected through the bus 15 in common. With the gestalt of operation concerning this invention, detection / judgment actuation for while having received the stronger electric wave and choosing an antenna in this microprocessor circuit 10 is performed.

[0016] The actuation is explained according to flow chart drawing of drawing 2 . first, it stood by in the condition of awaiting a received electric wave (step 20), and was shown in drawing 4 -- like -- the level of the minimum control voltage VCO -- predetermined level -- high level is detected as the minimum value Rmin for carrier sense, and is set up (step 21). And decision that it detects that control voltage VCO is larger than the minimum value Rmin which the above set up in the microprocessor circuit 10 if a transmitted electric wave is received and there is reception of a transmitted electric wave is issued (step 22).

[0017] Next, although diversity reception is started to a received electric wave, 0 is first set as the field strength R1 and R2 corresponding to two antennas 4 and 5 (ANT1, ANT2) as initial value at the beginning (step 24). This setting out is realizable by writing in in the storage region of RAM13 in the microprocessor circuit 10. And according to the count m which detects the field strength of the received electric wave of each antenna, an n value

is set as 2m (step 25). In this invention, a multiple-times received electric wave is detected, an antenna with higher field strength is chosen, and the precision of detection is raised. Therefore, according to the detection precision as which Count m is required, which integer of two or more values is chosen.

[0018] In order to detect whether the field strength of which antenna is strong, multiple-times detection of the field strength of the received electric wave of one antenna is carried out, the average value or an integral value is taken, and then he takes data with the same said of the antenna of another side, and is trying for field strength to choose the antenna of the strong one for both as compared with the last. Then, he is trying to detect the control electrical potential difference R0 which changes to 1 to 1 corresponding to field strength at step 27. A/D conversion of the control electrical potential difference VCO inputted into the microprocessor circuit 10 is specifically carried out in the interface section (step 28), and the electrical-potential-difference value R0 detected to the integral values R1 or R2 corresponding to the antenna under current selection is added (steps 29, 30, and 31). It realizes because the operation part 11 in the microprocessor circuit 10 also memorizes this processing to the field of RAM13.

[0019] An antenna will be changed, if the above-mentioned actuation is performed m times in succession to the same antenna and an n value reaches m (step 33). And if an n value is repeatedly set to 0 to the antenna which changed the same detection and addition m times (step 34), each integral value R1 and R2 will be compared (step 35), and the antenna of the larger one will be chosen (steps 36 and 37). Specifically, the antenna selection signal 17 is supplied to the antenna switch section 3. And it restores to the electric wave received from the selected antenna, and high transmission reception of quality is performed more. Finally, if reception is completed, return and a received electric wave await to the first loop formation, and it will be in a condition. Detection of termination of this reception is performed that it was less than the threshold detected first, or by detecting reception of a receiving terminate signal.

[0020] He carries out multiple-times detection of the control voltage value VCO, a RSSI signal which is not illustrated of AGC circuit 6 generated in recovery actuation by the receiving side in the microprocessor circuit 10, and is trying to choose the antenna which has received the stronger electric wave by comparing the integral value and the average of those detected values a passage clear from the above flow of operation. Therefore, there is especially nothing to add on a circuit and it can process all in the microprocessor circuit 10.

[0021]

[Effect of the Invention] According to this invention, it is more accurate at easy circuitry, and the antenna which has received the stronger electric wave can be chosen as explained above. Therefore, the space diversity reception actuation with more high quality is realizable.

[Translation done.]

* NOTICES *

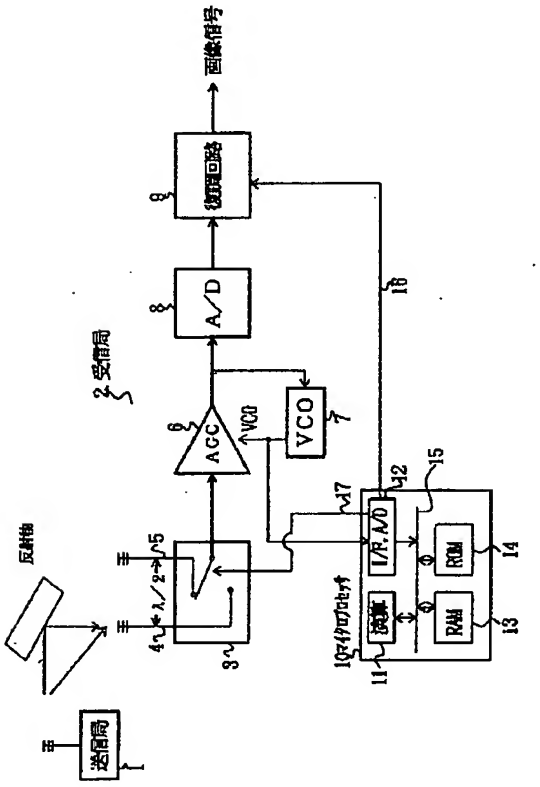
JPO and INPIT are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

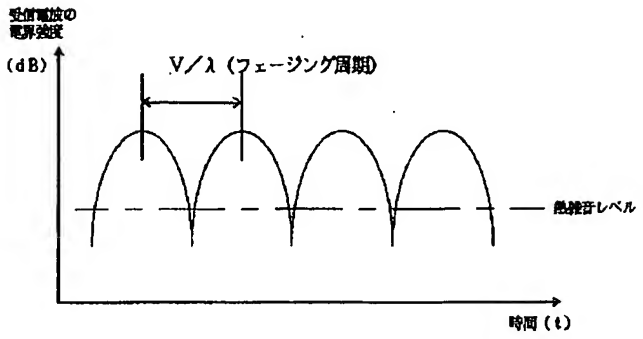
[Drawing 1]

本発明の実施の形態の全体図



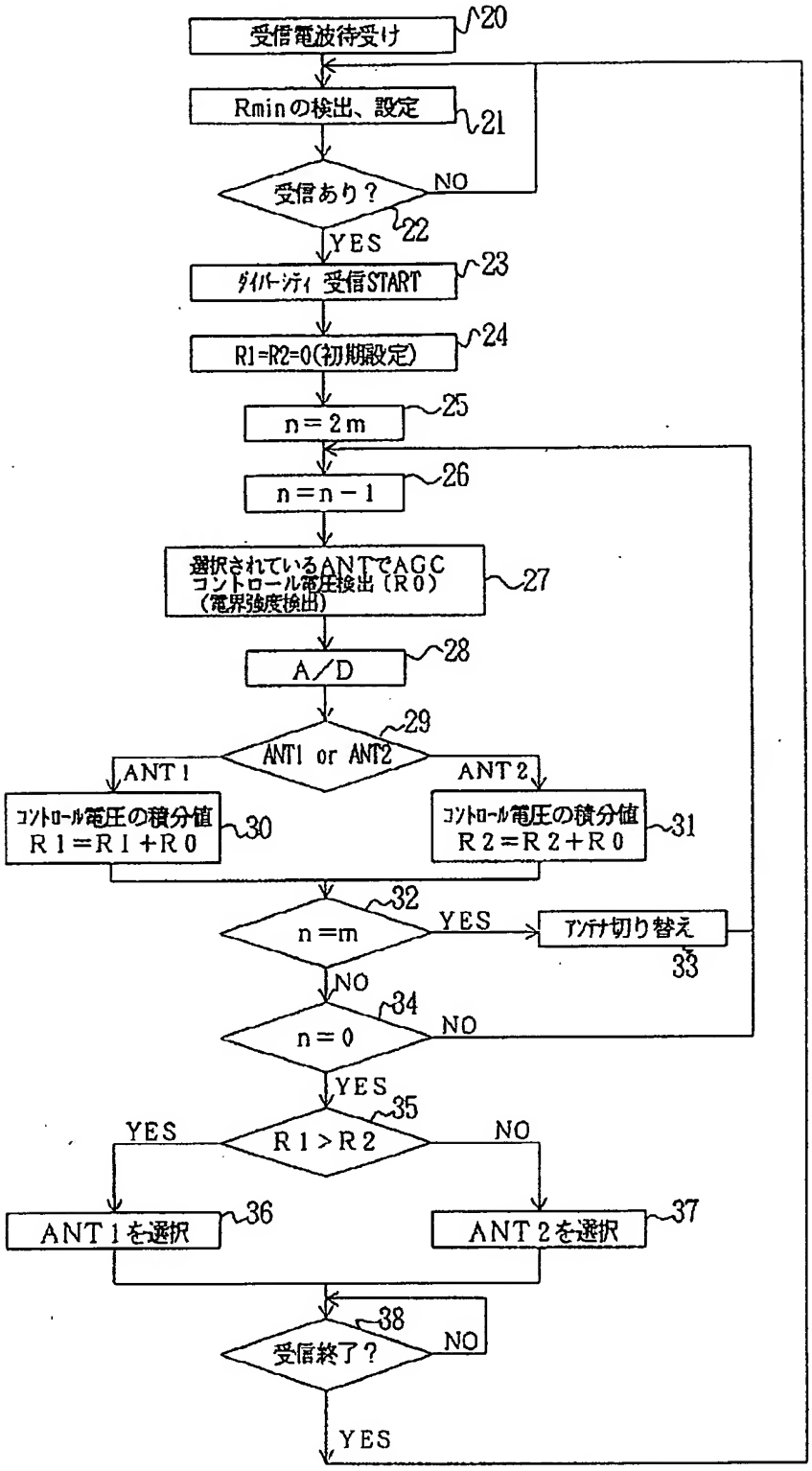
[Drawing 3]

フェージング現象を説明する図



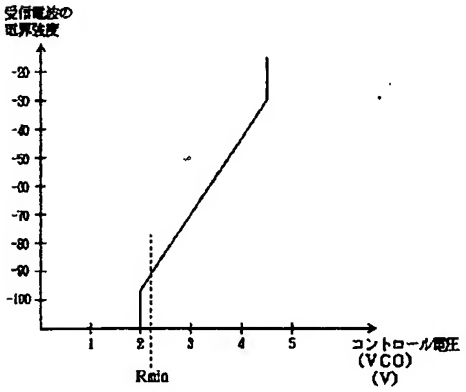
[Drawing 2]

本発明の実施の形態の動作フローチャート図



[Drawing 4]

AGC回路の制御電圧と受信レベルの関係図



[Translation done.]